

A RE-EVALUATION OF *BEALIA MEXICANA*
(POACEAE: ERAGROSTIDEAE)

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ABSTRACT

Based on morphological and cytological evidence, *Bealia* is recognized as a genus with a single species, *B. mexicana*. This genus may be related to *Dasyochloa* and *Erioneuron* as the three share a base chromosome number of $x=8$ and a number of morphological features. A key distinguishing *Bealia*, *Dasyochloa*, *Erioneuron*, and *Muhlenbergia* is presented. A full description, illustration, and citation of specimens examined are given for *Bealia mexicana*.

RESUMEN

En base a la evidencia morfológica y citológica *Bealia* es reconocido como un genero monotípico, conteniendo la especie *B. mexicana*. *Bealia* parece estar relacionado a *Dasyochloa* y *Erioneuron* por el hecho de que los tres géneros comparten el mismo numero básico de cromosomas ($x=8$) y otros tantos caracteres morfológicos. El presente artículo provee una clave para los géneros *Bealia*, *Dasyochloa*, *Erioneuron* y *Muhlenbergia*. Presentase además una descripción comprensiva de *Bealia mexicana*, así como su ilustración y citación de ejemplares estudiados.

During investigations of the annual species of *Muhlenbergia* Schreber (Peterson 1988a, b, 1989a, b; Peterson and Rieseberg 1987; Peterson et al. 1989; Peterson and Annable 1990) it became apparent that a segregate genus should be recognized for *Muhlenbergia biloba*. New information, particularly from chromosome cytology, coupled with numerous unusual morphological characters, supports its placement in *Bealia*. The purpose of this paper is to reinstate *Bealia* as a genus, discuss possible relationships to other eragrostoid genera, and give a complete taxonomic account.

The binomial *Bealia mexicana* was first published, without a description or a diagnosis, by Vasey (1889) and was based on material collected by *Pringle 819* from the mountains of Chihuahua and *Brandege 16* from Santa Margarita Island, Baja California Sur. Charlotte Reeder (1956) later showed that the specimen Brandege collected from Santa Margarita Island represented a new species, *Muhlenbergia brandegei* C. Reeder. I agree with C. Reeder that *M. brandegei* should currently reside in *Muhlenbergia*, however, the placement of the Chihuahuan material is the topic of this paper.

The first valid publication of *Bealia mexicana* was that of Scribner in Beal (1896) who based it on *Pringle 819* from Chihuahua, Mexico.

Jones (1912) transferred the species to *Epicampes*, naming it *E. mexicana*, but Hitchcock (1913) and subsequent workers have treated it as a species of *Muhlenbergia*, *M. biloba*.

The only other combination published in *Bealia*, *B. speciosa* (Vasey) Beal, was based on *Palmer 30* from southwestern Chihuahua. Hitchcock (1913), Soderstrom (1967), and I agree with Vasey in treating it as *Muhlenbergia speciosa* Vasey. Jones (1912) also transferred this species to *Epicampes*, naming it *E. speciosa*. *Epicampes* has been recognized as a section of *Muhlenbergia* subgenus *Podosemum* since Soderstrom's (1967) work.

Bealia mexicana has a base chromosome number of $x=8$ ($2n=16$) and relatively large chromosomes when compared with other species of *Muhlenbergia* (Peterson 1988a). This base number has not been reported for species of *Muhlenbergia* (J. Reeder 1967, 1968; Peterson 1988a). The common base chromosome number in *Muhlenbergia* is based on 10, although *M. filiformis* (Thurb.) Rydb. and *M. vaginata* Swallen possess 9 pairs.

Scribner and Vasey recognized the distinctive morphological features that distinguish *Bealia mexicana* from most other members of *Muhlenbergia*. It has deeply bilobed lemmas with obtuse lobes and pilose to villous glumes that are single-nerved and longer than the lemma. Only *M. argentea* Vasey and *M. lucida* Swallen from southern Chihuahua have deeply bilobed lemmas with obtuse lobes. These two species are currently being investigated as potential members of the genus.

In my investigations of the annual species of *Muhlenbergia*, A UPGMA cluster analysis utilizing 80 morphological and chemical characters depicted *B. mexicana* as a distinct species (Peterson 1988a). The cluster phenogram shows *B. mexicana* with a large phenetic distance of 1.4 and places it near *M. crispiseta* and *M. peruviana*, whose intra-cluster phenetic distance is very small at 0.55 (phenogram distance range is 0.3 to 1.7). These later two species are in the section *Clomena* and superficially resemble *B. mexicana*, but differ in having glabrous, three-nerved and three-toothed second glumes. The glumes of *B. mexicana* are pilose to villous, single-nerved, and entire near the apex.

Bealia mexicana shows close affinities with *Dasyochloa* Willd. ex Rydb. (interpreted as a monotypic North American genus) and *Erioneuron* Nash (includes four species in North America) by sharing a base chromosome number of $x=8$ and relatively large chromosomes (Tateoka 1961; Peterson 1988b). The lemmas of *Dasyochloa*, *Erioneuron*, and *Bealia* are similar. All are three-nerved, emarginate to bilobed, often awned, and pilose with hairs that are associated with either the nerves, margins, and/or lower two-thirds of the lemma. However, *Bealia* differs from *Dasyochloa* and *Erioneuron* in having spikelets with a single floret, soft membranous spikelets,

lemmas with crisped curled to flexuous awns, glabrous rachillas, fusiform caryopses, and an annual habit.

The unusual morphological characters in *B. mexicana* (Fig. 1) of a deeply bilobed lemma with obtuse lobes, pilose to villous glumes that are single-nerved and longer than the lemma, and a chromosome number of $n=8$, support the original treatment of *Bealia* as a distinct genus. The following key distinguishes among *Bealia*, *Dasyochloa*, *Erioneuron*, and *Muhlenbergia* using gross morphological features.

- A Spikelets with one floret, rarely two.
 - B Lemmas deeply bilobed, the lobes rounded to obtuse, the lobes 1–1.4 mm long; awn crisped-curved to flexuous, borne between the lobes. *Bealia*
 - B' Lemmas not deeply bilobed, sometimes minutely bifid, then the teeth usually acuminate to aristate, the teeth less than 1 mm long; awn usually straight to flexuous or awnless. *Muhlenbergia*
- A' Spikelets with two to many florets.
 - C Panicle short and capitate, usually exceeded by a fascicle of leaves; plants low, creeping, usually stoloniferous. *Dasyochloa*
 - C' Panicle exerted, open or contracted; plants spreading, erect or decumbent but not stoloniferous. *Erioneuron*

BEALIA Scribner in Hackel, True Grasses 103. 1890.

BEALIA MEXICANA Scribner in Beal, Grasses N. Amer. 2:267. 1896. — *Bealia mexicana* Scribner in Vasey, nom. nud. Proc. Calif. Acad. Sci. II. 2:212. 1889. — *Bealia mexicana* Scribner in Hackel, nom. nud. True Grasses 103. 1890. — *Epicampes mexicana* (Scribner in Beal) M. E. Jones, Contr. W. Bot. 14:7. 1912. — *Muhlenbergia biloba* A. Hitchc., Contr. U.S. Natl. Herb. 17:294. 1913. — TYPE: MEXICO. Chihuahua: thin soil of dry porphyry mts., near Chihuahua, 7 Oct 1886, Pringle 819 (lectotype selected herewith, US!; isolectotypes, MO!, NME!, NY!, UC!, US!, VT!, WIS!).

Slender, tufted annuals (Fig. 1a). Culms much branched at the lower nodes, often caespitose, scabrellous-pubescent, striate, glabrous to minutely pubescent below the nodes, 9–35 cm tall; 0.3–0.5 mm diam. just below the inflorescence, internodes hollow, short, 2–10 mm long. Sheaths keeled, often striate, scaberulous to almost glabrous, longer than the internodes, usually 2–7.5 cm long; margins wide and scarious. Ligules membranous (Fig. 1b), 1.5–3.4 mm long, apex acute or rounded, often irregularly toothed; margins entire, decurrent, usually splitting to form auricles no longer than the ligule (Fig. 1c). Blades flat, involute upon drying, 1–7 cm long, 0.6–1.4 mm wide, scaberulous below and short pubescent above, midnerve and margins whitish-thickened on the abaxial surface. Inflorescence an open panicle (Fig. 1c), 3–10 cm long, 1.5–3.2 cm wide; branches 1 or sometimes 2 per node, 1.8–4.5 cm long, sinuously ascending or flexuous and spreading up to 40° from the culm axis; pedicels

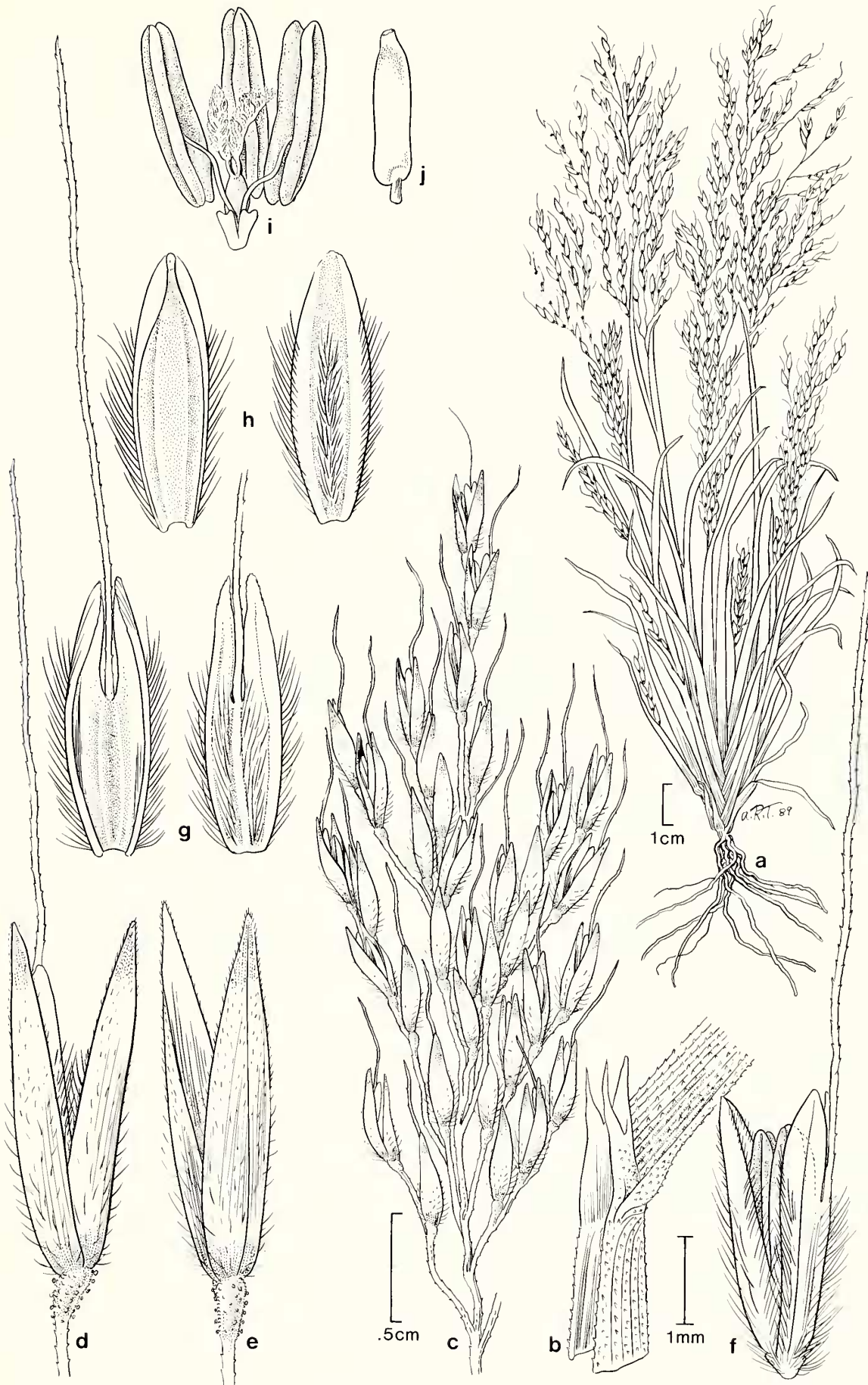


FIG. 1. *Bealia mexicana*, Chihuahua, Mexico (Peterson and Annable 5800). a. Habit. b. Ligule. c. Inflorescence. d. Spikelet. e. Glumes. f. Floret. g. Lemma. h. Palea. i. Stamens, pistil, and lodicules. j. Caryopsis.

slender, scabrous and minutely glandular, 1–5.5 mm long, loosely ascending; nodes per inflorescence 6–16. Spikelets erect to loosely spreading, 1 floret per spikelet (Fig. 1d, f), disarticulating above the glumes. Glumes equal in length (Fig. 1e), grayish-green to almost bicolored with the lower $\frac{1}{4}$ grayish-green and upper $\frac{3}{4}$ whitish-green, obtuse, loosely pilose to villous, especially on lower $\frac{2}{3}$, faintly 1-nerved, 3.2–4.8 mm long, as long or longer than the lemma. Lemmas 3-nerved, 2.9–3.5 mm long loosely to densely appressed-villous on the lower $\frac{2}{3}$ (Fig. 1g), hairs tawny, up to 0.7 mm long; lateral nerves evident on lower half; apex deeply bilobed, 1–1.4 mm deep, lobes rounded to obtuse; awn born between the 2 lobes, scabrous and crisped-curved to flexuous, 4–6.5 mm long. Paleas 2-nerved (Fig. 1h), 2.6–3.4 mm long, about as long as lemma, apex obtuse, loosely to densely appressed-villous on the lower $\frac{2}{3}$, hairs like those on the lemma. Stamens 3 (Fig. 1i), anthers 1.2–2.3 mm long, purplish. Caryopsis (Fig. 1j) ca 1.8 mm long, fusiform, olive-brown. Chromosome number, $n=8$.

Habitat, distribution, and phenology. Shallow, sandy, whitish soils derived from calcareous parent material on flat escarpments associated with rock outcrops in pinyon-juniper woodlands and yellow pine forests, 2000–2300 m elevation. Central Chihuahua to northern Durango, Mexico, known from very few localities. Flowering from Sep through Oct.

Specimens cited. MEXICO. Chihuahua: Majalca, 16 Sep 1935, *LeSueur Mex-026* (GH, MO, UC); 15 mi E of El Vergel on road to Parral, 21 Oct 1959, *Correll and Gentry 23270* (GH, MO, UC); Sierra Madre Occidental, 1.2 mi W of Cumbres de Majalca, 22.6 mi W of Hwy 45, Campamento in Parque Nacional, 20 Sep 1986, *Peterson and Annable 4529* (ARIZ, ENCB, GH, MEXU, MICH, MO, NMC, NY, RSA, TAES, UC, US, UTC, WIS, WS), 22 Sep 1988, *Peterson and Annable 5800* (US); 12 mi S of Villa Matamoros, 27 Sep 1988, *Peterson and Annable 5976* (US). Durango: Barranca below Sandia Station, 12 Oct 1905, *Pringle 10147* (GH, UC, MO); Sierra Madre Occidental, ca. 6 mi SW of El Ojito and 40 mi SW of Parral on Hwy 24, 24 Sep 1986, *Peterson and Annable 4570* (ARIZ, ENCB, GH, MEXU, MICH, MO, NMC, NY, RSA, TAES, UC, UNLV, US, UTC, WIS, WS).

ACKNOWLEDGMENTS

This study was supported by grants from the National Science Foundation to Amy Jean Gilmartin and PMP (BSR-861211), Sigma Xi, WSU, and the Smithsonian Institution. Special thanks are given to Carol R. Annable for assistance in the field and Alice Tangerini for providing the illustration. I am grateful to Carol R. Annable, Mary E. Barkworth, Amy Jean Gilmartin, Stephen L. Hatch, and David J. Keil for critically reading the manuscript and Pedro Acevedo for preparing the Spanish abstract.

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(Received 30 Jan 1989; revision accepted 3 Jul 1989.)

ANNOUNCEMENT

NEW PUBLICATION

FRYXEL, P. A., Malvaceae of Mexico, *Systematic Botany Monographs*, Vol. 25, pp. [i–ii], 1–522, color fp. 13 Dec 1988, ISSN 0737-8211, ISBN 0-912861-25-8 (hardbound), \$40.00 U.S., \$42.00 foreign, post-paid (from Systematic Botany Monographs, University of Michigan Herbarium, Ann Arbor, MI 48109-1057, with checks payable to “ASPT”). [A monumental opus, on 55 gen. (incl. *Allosidastrum*, gen. nov.), 372 spp. (184 endemic), 10 infraspecific taxa, with introductory sections on endemism, diversity, familial subdivisions, specialized characters, common names, the massive taxonomic part (448 pp.), and concluding biblio., appendices (chief references on important collectors of Mexican plants; new sections in *Hibiscus*, by O. J. Blanchard), species list, and indices to specimens and scientific names.]